Inventory & Monitoring
Pacific Island Network

National Park Service
U.S. Department of the Interior

Pacific Island Network Quarterly

A Sign... Sealed and Delivered

A mama monk seal is content to pup on a Kalaupapa NHP beach. A good sign that the surroundings are not only safe, but healthy enough for her young. pg. 6

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National Park Service
U.S. Department of the Interior
Pacific Island Network
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The National Park Service (NPS) has implemented natural resource inventory and monitoring (I&M) on a servicewide basis to ensure all park units possess the resource information needed for effective, science-based management, decision-making, and resource protection.

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NOTE: Unless indicated all photos and articles are NPS.

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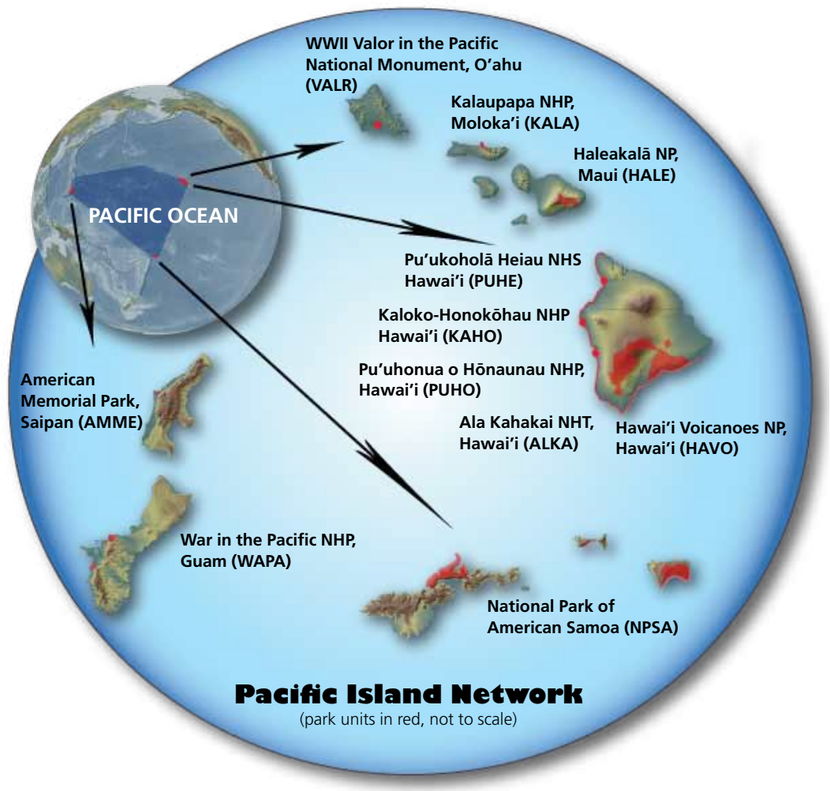
Field Schedule

	Oct.	Nov.	Dec.
Anchialine monitoring	HAVO		
Invasive plants		HAVO	HAVO
Vegetation communities	NPSA	NPSA	
Water quality	HALE	WAPA, AMME, KALA	West Hawaii Parks
Stream animals			
Ground water		AMME	KAHO
Benthic marine	KAHO		
Marine fish	KAHO		
Vegetation mapping	HAVO	HAVO, HALE	HAVO, HALE
Climate (on-going)	All Parks ----------		



Water Report from Pu'ukoholā Heiau NHS

The brackish waterbody at Pu'ukoholā Heiau National Historic Site in Pōhaukole Gultch, inshore of Pelekane Bay is the only waterbody in the park. This waterbody has the appearance of a stream channel, but is frequently a stagnant pond, and experiences intermittent overland connection with the ocean.

This waterbody was sampled quarterly from the last quarter of 2007 through 2011 (and continues to be regularly sampled). During this time two notable events were observed: a likely minor algal bloom in 2009 and a flood event in 2011. Slightly elevated nutrient concentrations were observed prior to and during the bloom. Given the open canopy of the system and abundance of sunlight, nutrient concentrations will likely govern the risk of future blooms. Should a bloom occur in the future, surface scums could form depending on algal species and water temperature. In general, blue-green algae blooms and high ambient temperatures increase the risk of surface scums.

Heavy rains in this typically arid system in 2011 contributed a pulse of freshwater. Data from the observed flood event suggest that relatively large amounts of nutrients, especially nitrogen, were delivered to the waterbody. Future evaluations of the natural range of conditions, one of the primary goals of the I&M Program, should account for the environmental context of both low-flow and freshwater-pulse conditions.

And if that whet your whistle, see the full report.

My Name is James Gurr

...born and raised in American Samoa. *I have always been interested in the outdoors. I remember always tending my family's vegetable farm. After many subsequent trips to our farm and exploring the native forest, I realized how great it would be to understand how plants grow and survive. After attending our community college, I went abroad to the University of Hawai'i at Mānoa and completed a Bachelor's degree in Botany. Shortly after, I returned to American Samoa and continued to work for my parent's vegetable farm. One year later I was employed by the National Park of American Samoa. I have been on temporary assignments for eight years with the Park and worked in various divisions. My passion for the trees brings me yet again to an important highlight of my career with the NPS. I am now working with the Pacific Island Network Inventory and Monitoring Program. I currently work with a crew of 5 people: Visa Vaivai (crew leader), Anthony Wyberski, Tanu Iosefa, Sala Eliu, and Lafaele Alosio. This is an amazing crew. We are all natives of American Samoa from different backgrounds with a shared passion for the outdoors. The crew members have contributed valuable information and moral support, both individually and as a group, to the Focal Terrestrial Plant Community monitoring project currently underway here in American Samoa. I am proud to be a part of this I&M crew and looking forward to completing the project. Faafetai lava.*

~James Gurr, NPS

A typical afternoon at Pōhaukole Gultch in Pu'ukoholā Heiau National Historic Site.

Check out a short video of the modest 2011 tsunami surge of water into this area.

The Whole Ground Truth

A Typical Day in the Field

Grab your partner, gear, GPS, maps, notes, camera, and compass. Don't forget your lunch. Now, hike for miles through forests and across lava fields. Reapply sunscreen. Try to navigate to the very center of a pre-selected 90 square meters circle. Record the plants you see (e.g. 40% of the circle is koa trees, 32% is pūkiawe, 18% is molasses grass, the rest is bare lava). Later, check to see if what you found matches what the professional mappers thought was in that circle. Take more notes, then adjust the vegetation map if needed.

Locate and go to the next circle. Repeat over 2,000 more times.

That's accuracy assessment (AA) for the vegetation mapping inventory.

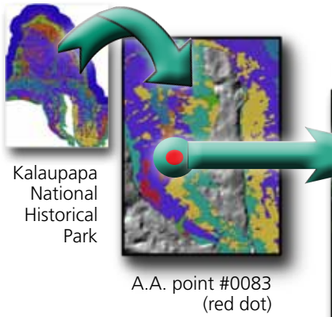
What is a Vegetation Map ?

The maps are snap-shots in time of the land cover (e.g. plants, buildings, lava) in a park. Developing a vegetation map is an extensive process which integrates field data, vegetation classification (e.g. area "X" is a koa/pūkiawe woodland), expert park knowledge, spatial analysis, and complex computer models. The layering of all this information leads to a map of the land cover across a park landscape. Vegetation maps are important tools to assist resource managers, and they provide comprehensive data for future research.

Remind Me What Accuracy Assessment is Again ?

The final stages of field work for vegetation mapping requires rapid physical assessments across the parks' landscapes to test the accuracy of the maps (known as accuracy assessment or AA). You may have heard it referred to as "ground-truthing".

At each Pacific Island Network (PACN) park, scores or hundreds of sites are visited by field crews. Armed with dichotomous keys and descriptions of the parks' vegetation communities, field crews hike far and wide to gather real, on-the-ground data to compare against the current vegetation maps. Afterwards, the accuracy assessment data is analyzed by the mappers (Kass Green & Associates) to determine how accurate the map is. This process helps to ensure that the best possible vegetation maps of the parks are born.



Kalaupapa National Historical Park

A.A. point #0083 (red dot)

In this instance, point #0083 in Waihanau Valley was assessed by the field crew as a "Kukui lowland wet forest". This assessment matched the vegetation classification on the map to the left. This point is deemed accurate.

The Crews

Accuracy assessment field work is extensive and requires help from many hands. Field crews are based at several parks. However, due to the substantial number of AA sites and the vast landscapes involved, a broadly collaborative effort is required to meet our goals. For instance, at Hawai'i Volcanoes National Park (HAVO), two (of three) field crew leaders are cooperating employees from the Research Corporation of the University of Hawai'i (RCUH). The HAVO team receives additional help from NPS Volunteers, NPS field crews from other parks, and HAVO Resource Management staff. Even PACN office employees get an occasional opportunity to get out in the wild and help the field teams. In total, for just the HAVO vegetation map inventory, at least 17 people have been involved in some aspect of the project.

The Assessment Continues

The vegetation mapping crew has completed accuracy assessment field work in several parks, however, final maps are still works-in-progress for most parks. Accuracy assessment is underway at HAVO, and field work will begin in November, 2013 at Haleakalā National Park.

–Meagan Selvig, RCUH
–Kathryn Akamine, RCUH

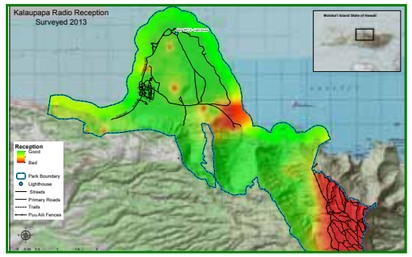
1,690 AA points are complete
(September 1, 2013)

Haleakalā NP: **TBD**
NP of American Samoa: **251**
Pu`ukoholā Heiau NHS: **57**
Kalaupapa NHP: **244**
Pu`uhonua o Hōnaunau NHP: **82**
American Memorial Park: **48**
Kaloko-Honokōhau NHP: **90**
War in the Pacific NHP: **163**
Hawai`i Volcanoes NP: **755** of **1,048** (planned)

Three Bonuses from This Project

Along with the valuable vegetation map data for park management and future research, the map project has provided us with some secondary benefits.

Better safe than sorry. The crew at HAVO tests their volcanic gas filters.



Can you hear me now?

While conducting A.A. at Kalaupapa NHP, the crew also performed radio and cell phone checks at all 244 points. The red indicates communications dead zones.

Enhancing Park Safety

Radio and cell phone receptivity maps.
In an effort to maximize the information gathered during the accuracy assessment work underway at several Hawaii parks, field staff has been testing radio receptivity and cell phone reception at each plot location while conducting the AA. The PACN GIS Specialist uses the receptivity data to run line-of-sight communications analysis to develop maps of high and low receptivity (above). These maps can be used by park resources management, fire management, and law enforcement to better understand communication limitations which makes the backcountry a safer place to visit.

Field crew safety preparation.
Due to the varied terrain, climate, natural hazards, and other factors in PACN parks, there are always special safety considerations. Each park has its own specific safety protocol. Before any work is attempted, a job hazard analysis is completed for existing and potential dangers that are inherent with working in the field. All hazards are considered and corrective measures are recommended prior to entering the field. Each field crew member is trained and outfitted with all the relevant safety gear and personal protective equipment. With daily safety discussions and up-to-date trainings, field crews are prepared for virtually any situation.

Invasive Plant Alerts

Although accuracy assessment field work is designed to be rapid, incidental observations in the far reaches of the park may be valuable to park resource managers. For example, during the AA field campaign at Kalaupapa National Historical Park, crews used the new Early Detection of Invasive Plant Species Cards as they walked the ridges and valleys of the park. They came across a handful of the invasive species from the cards while on the peninsula and along the trailheads. While some of these species are already being controlled by park staff (e.g. *Argemone mexicana*), others have not yet been targeted (e.g. *Stapelia gigantea*). PACN staff are happy that the cards are getting out into the field and serving as a tool for both education and, exactly what they are intended for, early detection of invasive plants.

Literally Awesome Places

Admittedly... this one is a little esoteric.
Field crews enjoy AA work because it takes them to some of the most amazing and least visited areas of the parks. After accounting for possible safety hazards and accessibility, AA sites are chosen at random. Essentially, crews navigate and hike all day through varied topography and vegetation while maintaining an ecological perspective, and observing vegetation changes along the way. The Nature Conservancy has identified nine different ecoregions within HAVO alone. The amazing places and sheer variety of landscapes create unique and beautiful experiences for the field crews every day.

A Sign... Sealed and Delivered

Raise your flipper if you are the record 10th monk seal to be born at Kalaupapa National Historical Park this year !

The critically endangered Hawaiian monk seal (*Monachus schauinslandi*) is one of the rarest marine mammals in the world. Its Hawaiian name, ʻĪlio holo i ka uaua translates to "dog running in rough seas". Along with fewer than 600 remaining Mediterranean monk seals (*M. monachus*), Hawaii's seals are the last of the world's monk seals (a third species, the Caribbean monk seal, is extinct).

The Hawaiian monk seals' dwindling population of about 1,200 individuals has experienced a continuous decline of about 4% annually in the Northwestern Hawaiian Islands. Conversely, the population of monk seals in the main Hawaiian Islands has seen a gradual increase since the mid 1980's, and is now estimated to be about 150 individuals.

The beaches at Kalaupapa National Historical Park on Molokaʻi Island are one of the premier pupping sites in the main Hawaiian Islands. Since 1997, there have been 78 monk seals born on Molokaʻi, and all but one of those were born in Kalaupapa. This year we welcomed a record number of births... 10 newborns !

Kalaupapa NHP works in conjunction with National Oceanic and Atmospheric Administration researchers on efforts to better understand monk seal behavior and long-term movement patterns. The NPS Inventory & Monitoring Program also contributes to the effort through the monitoring of many aspects of the marine realm... from coral reef health to water quality. The health of the habitat has profound implications with the monk seals' wellbeing.

Once born, a jet-black monk seal pup feeds on the nutrient rich milk from its mother for about 6 -7 weeks. If we are able to locate the placenta soon after birth, it is frozen for DNA analysis. Researchers have demonstrated that there is extremely low genetic diversity in Hawaiian monk seals, most likely due to long-term population size restriction. This has the potential to hinder the overall genetic fitness of the monk seal species.

After weaned from its mother, the plump pup is usually bleach tagged for visual identification. Bleach tags come off with the seal's annual molt, a process in which it sheds its outer coating for a new one. Later, when the opportunity presents itself, researchers tag the seal's rear flippers with a red coded tag for long-term tracking. Such research furthers our understanding of the seals' behavior and habitat use, with the ultimate goal of improving conservation management strategies and fostering their proliferation.

–Sylvester (Sly) Lee, NPS

For more on natural history, visit Kalaupapa NHP's facebook page.

A tagged flipper.

"I had the honor of receiving the grand prize for the 2012 Share the Experience Employee Photo Contest with this picture of one of our resident seals at Kalaupapa NHP. As I strive to communicate science in meaningful ways to the public, I hope to draw attention to lesser known, but by no means less important, topics ranging from coral chemical ecology to invasive species." –Sly

Life on the Decks of Sunken Ships

Corals, fish, worms, algae, and sponges have settled on the sunken hulls of WWII Valor in the Pacific National Monument

Over 70 years ago the U.S.S. Arizona and the U.S.S. Utah were attacked and sunk in Pearl Harbor, Hawaii, taking the lives of hundreds of men with them.

Nature invariably finds a way to overcome even the most egregious of human follies. Today, over 45 species of marine organisms live and flourish on the hulls of the two ships, according to a survey conducted by scientists at the Hawaii Institute of Marine Biology.

Comparing the results of this 2011 study led by Dr. Steve Coles from the Hawaii Biological Survey of the Bishop Museum in Honolulu, HI with those of a similar study in 1986, suggests that substantial changes in the ocean life on both ships have occurred in the last 35 years.

Twenty-one species of fish were identified on the U.S.S. Arizona and 18 species on the U.S.S. Utah in 2010. The fishes on both vessels were dominated by two species of surgeonfish (*Acanthurids)*, and by the sergeant major (*A. abdominalis)*. Although similar numbers of fish species were found around the U.S.S. Arizona in 2010 as in the 1986 survey (25 species), only eight species were found in common between the two studies.

This finding suggests that the composition of the fish community has changed substantially.

Where surfaces of both ships are not covered by silt or rubble, they support a rich assemblage of organisms dominated by sponges and worms. The *Branchiomma sp.* tubeworm was the most abundant organism reported on the U.S.S. Arizona in the 1986 survey, but it appeared to be less abundant in 2011. This finding suggests that lower organic particulate levels in Pearl Harbor water have diminished the food source for this organism that relies on suspension feeding.

The most significant finding of this study was the establishment of an apparently thriving community of hard corals on both vessels. They are dominated by *Pocillopora damicornis* and *Leptastrea purpurea*, and include a few large colonies of *Porites compressa* and *Porites lobata*.

Over 635 total corals were counted and measured on the U.S.S. Arizona and 60 corals on the U.S.S. Utah, most of them occurring on deck areas but also along the ships' sides. Interestingly, no corals were reported on the U.S.S. Arizona in the 1986 survey or elsewhere in a comprehensive survey of Pearl Harbor conducted from 1971-73. It is likely that this recent coral growth is a positive response to the improved water quality and clarity that has been achieved in Pearl Harbor in the last 30 years.

At the present rates of coral accumulation it is possible that large sections of the U.S.S. Arizona and the U.S.S. Utah may become encased in coral. This may require a decision of whether to allow coral accumulation to progress, or to selectively remove coral to maintain the structural integrity of these historic ships.

–Corbett Nash, NPS

Look for the full report soon at irma.nps.gov.

Note: Pacific Coral Reef Program provided partial funding to support this inventory when the program was administered by the PACN.

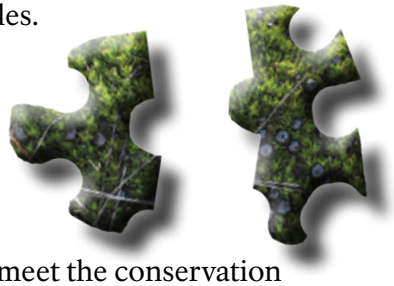
A Few Puzzle Pieces at 6,000 Feet

What can a few puzzle pieces tell us about a big picture? Perhaps not a lot, but without them the picture is noticeably incomplete. Never before has society required us to gather so many pieces across hundreds of scientific disciplines with a single purpose - understanding a changing climate.

From universities across the globe to NASA and many other organizations (and yes, the National Park Service too), scientists are working together to study aspects of the world with a goal of understanding how the climate changes ecosystems and societies, and how the world can adapt.

The Hawaiian Islands are an ideal place to model plant community response to climate change because large portions of these high elevation tropical islands are protected as conservation lands. Extensive climate studies and localized climate prediction models have been and continue to be developed for the region.

Current projections for Hawaii forecast that climatic zones are changing and "novel" climates (e.g. hotter and drier) are anticipated at high altitudes. Ecological theory predicts the effects of specific factors (e.g. elevation, invasive species) on vegetation patterns and many studies have examined these factors in Hawaii, but few have identified the relative importance of multiple factors simultaneously at both landscape and regional or island scales.



To meet the conservation challenges associated with rapidly shifting climates, one necessary step is to identify current species distributions, functional traits, and understand the underlying drivers sustaining and changing natural communities. The concept is simple - record specific data today to allow for comparisons in the future. Part of the mission of the NPS Inventory & Monitoring Program is to do just that.

The vegetated zones at Haleakalā and Hawai'i Volcanoes National Parks above about 6,000 ft. are known as subalpine shrublands. They are dominated by pūkiawe, 'ōhelo, kūkaenēnē, 'a'ali'i, and a host of other native and non-native species. The Inventory & Monitoring Program just completed its first vegetation community monitoring survey in this nosebleed section of the two parks.

The program identified 117 species (43% native) across the subalpine shrublands of Haleakalā and Hawai'i Volcanoes National Parks. Although the majority of species were non-native grasses, total non-native cover remains low (14%) as compared to native cover (40%) in this plant community.

Even though only 30% of species were in both parks, the vegetation did not differ dramatically by island, soil type, or lava flow age. This opens the door for scientists to examine if and to what extent climatic variables, specifically rainfall and temperature, are associated with vegetation patterns on these mountains.

Preliminary results suggest that climatic variables (at least mean annual rainfall) are more important in explaining vegetation patterns across the subalpine shrubland than other factors such as geography or the soil. This is a critical discovery for modeling the potential impacts of shifting climatic conditions on Hawaiian subalpine vegetation.

Clearly, this is only the first step. As we continue, we hope to further elucidate and define vegetation-climate relationships in this unique and threatened community.

The baseline vegetation data on plant communities that we collected on these mountains is a critical puzzle piece in the grand scheme of a globally changing climate. When analyzed together with other scientific work, the broader science conducted today will become the puzzle pieces needed to aid in our understanding of a complex big picture.

–Alison Ainsworth, NPS